REMARKS

Claim Rejections – 35 U.S.C. § 103(a)

The Examiner has rejected claims 1-8, 10-12, 16 and 17 under 35 U.S.C §103(a) as being unpatentable over Ngo et al. (U.S. Patent 6,281,584). Claims 9, 13-15, and 21-35 are rejected under 35 U.S.C §103(a) as being unpatentable over Ngo et al. in view of Naik et al. (U.S. Patent 6,245,662). Applicant does not admit that Ngo et al. is prior art and reserves the right to swear behind the reference at a later date.

Nonetheless, Applicant respectfully submits that claims 1-17, 21, and 23-28, are not rendered obvious by Ngo et al. because the reference does not teach or suggest every element of these claims.

In independent claims 1 and 10 and amended independent claim 21, Applicant teaches and claims a method for forming a dielectric, which includes forming a fluorine containing film on a substrate and exposing the film to a reducing plasma which is formed in a chamber remote from the reaction chamber containing the substrate. The use of remote plasma reduces or eliminates ion bombardment, allowing for greater surface specificity and lower damage to the material being depleted of fluorine.

Ngo et al. discloses a method for depleting fluorine from the top surface of an SiOF dielectric deposited on a substrate. After the SiOF layer is deposited, vias are etched through the SiOF layer and the structure is subjected to a resist strip and clean step (Ngo et al., col. 4, lines 26-30). Ngo et al. teaches subjecting the SiOF layer (64) to an ammonia (NH_3) plasma treatment to deplete fluorine at the surface of layer 64 in step 54

(Ngo et al., col. 6, lines 18-20). Ngo et al. teaches that step 54, plasma treatment of the SiOF, is a plasma-enhanced CVD (PECVD) step performed with high ion bombardment (Ngo et al., col. 6, lines 26-28). Ngo et al. teaches away from the use of remote plasma as claimed by Applicant by teaching that the plasma treatment is a step performed with high ion bombardment. Remote plasma is a process that reduces or eliminates ion bombardment. The use of remote plasma in step 54 would not produce the high ion bombardment that Ngo et al. desires. Furthermore, Naik et al. also fails to teach the use of remote plasma on a fluorine containing film. Therefore, Applicant respectfully submits that neither Ngo et al. nor Naik et al., independently or in combination, render independent claims 1, 10, and 21 obvious, because the references do not teach or suggest every element of these claims.

Claims 2-9, 11-17, and 23-28 are dependent upon claims 1, 10, and 21, respectively. Thus, for at least the same reasons advanced above with respect to independent claims 1, 10, and 21, Applicant respectfully submits that neither Ngo et al. nor Naik et al., independently or in combination, render these claims obvious.

Regarding amended independent claim 29, Applicant teaches and claims a method of forming a dielectric, which includes forming a fluorine containing film on a substrate, depositing a hardmask layer on the top surface of the fluorine containing film, forming via openings in the fluorine containing film, where the via openings define sidewalls, and exposing the hardmask layer and the sidewalls to a reducing plasma. The use of a hardmask layer on the top surface of the fluorine containing film protects the top surface of the fluorine containing film from fluorine depletion by the reducing plasma, while the sidewalls of the vias are depleted.

Ngo et al. teaches a method of forming a dielectric comprising forming a fluorine containing film on a substrate, forming via openings in the fluorinated material, and exposing the top surface of the fluorine containing film to a reducing plasma, where the fluorine depleting plasma treatment is a PECVD step performed with high ion bombardment (Ngo et al., Col. 6, lines 15-29). Ngo et al. does not teach forming a hardmask on the fluorine containing film, nor does Ngo et al. teach exposing both the hardmask layer and the via sidewalls to a reducing plasma. Ngo et al. teaches away from using a hardmask on top of the fluorine containing film. Ngo et al. wants to deplete the top surface (84) using plasma (col. 6, lines 21-22). Thus, it would not be obvious for one of ordinary skill of the art to combine the hardmask layer of Naik et al. with the high ion bombardment and top surface depletion taught by Ngo et al. If the hardmask layer disclosed by Naik et al. (Naik et al., Col. 3, lines 61-67) were used by Ngo et al., the top surface (84) would not be depleted by plasma, nor would the top surface be bombarded by ions during PECVD (54). Therefore, Applicant respectfully submits that neither Ngo et al. nor Naik et al., independently or in combination, render independent claim 29 obvious.

Claims 30-35 are dependent upon independent claim 29. Thus, for at least the same reasons advanced above with respect to independent claim 29, Applicant respectfully submits that neither Ngo et al. nor Naik et al., independently or in combination, render dependent claims 30-35 obvious.

It is Applicant's understanding that the cited references fail to teach or render obvious Applicant's invention as claimed in claims 1-21 and 23-35. Applicant

respectfully requests the removal of the 35 U.S.C. §103(a) rejection of claims 1-21 and 23-35 and seeks an early allowance of these claims.

If there are any additional charges, please charge Deposit Account No 02-2666.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

21. (Amended) A method of forming a[n interlayer] dielectric [in an integrated circuit], comprising:

depositing a material on a substrate, wherein the material is selected from the group consisting of a-C:F, parylene AF4, carbon-doped SiOF, fluorinated organic polymers, and fluorinated siloxane polymers; [and]

forming via openings in the material; and

exposing the material to a reducing plasma in a reaction chamber, wherein the reducing plasma is formed in a chamber remote from the chamber containing the material.

29. (Amended) A method of forming a[n interlayer] dielectric, comprising:

forming a fluorine containing film on a substrate having a top surface;

depositing a hardmask layer on the top surface of the fluorine containing film;

forming via openings in the fluorine containing film, wherein the via openings define sidewalls; and

exposing the hardmask layer and the sidewalls to a reducing plasma.

30. (Amended) The method of Claim 29, further comprising exposing the hardmask layer and the sidewalls to the reducing plasma in a reaction chamber, wherein the reducing plasma is formed in a chamber remote from the reaction chamber containing the fluorine containing film.